INTERCROPPING in semi-arid areas

Report of a symposium held at the Faculty of Agriculture, Forestry and Veterinary Science, University of Dar es Salaam, Morogoro, Tanzania, 10-12 May 1976

Editors:
J. H. Monyo, A. D. R. Ker, and Marilyn Campbell

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Intercropping in Semi-Arid Areas

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Farmer's field near Ibadan, Nigeria, showing intercrop of cowpea under maize
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Mixed Cropping Research at the Institute for Agricultural Research, Samaru, Nigeria

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Because agricultural research in developing nations has been conditioned by cropping systems of the more developed countries, little attention has been paid to indigenous cropping systems, in particular mixed cropping systems of subsistence farmers. Most research has been directed to increasing production under sole cropping (a predominantly temperate system) instead of asking how to increase production under mixed cropping (the dominant system of tropical subsistence farmers). It is the lack of knowledge of the principles underlying mixed cropping that has prevented the application of improved technology to these farmers.

Although research with mixed crops has been done at this Institute over the past 25 years, albeit intermittently, little progress was made until the findings of Norman (10) that not only is labour used more efficiently but also that returns are less variable from year to year from mixed cropping than from sole cropping. Recognition that mixed cropping is based upon sound economic sense, and is far from being an unsophisticated form of agriculture, led to renewed research at the Institute.

Current research has been directed to answering one question. "Is mixed cropping intrinsically higher yielding than equivalent sole cropping?" As a baseline to answer this question we took a 3-year mixed cropping rotation common to the area around the Institute.

Experiments with the 1st year break, mixtures of a 1:1 ratio of millet and sorghum, showed that yields of both were higher when grown in mixture than when grown alone. This occurred because the different canopy structure formed by mixing a fast-growing early millet with a short, late sorghum allowed better light utilization early in the season when millet was taller than sorghum, and later when the millet had been harvested. It was also demonstrated that adding maize to the mixture gave even greater returns.

For the 2nd year, when the "gicci" system of intercropping cereals with groundnut is practiced, experiments demonstrated that the reduced yield of groundnut, because of competition from cereals, was more than compensated by yield of cereal. This mixture consistently gave returns 30% higher than equivalent sole crops.

In the final year cotton is sown relay within cereals. This is done because farmers are unable to devote time to land preparation for cotton, being more concerned with weeding and harvesting early cereals to end the "hungry gap" after a long dry season. Cotton, consequently, is sown late and within the cereal. Yields are poor. We have demonstrated that rather than sow cotton late within cereal, thus reducing the period of overlap, cotton should be sown under cereal as early as possible, sowing date having a far greater effect on yield than period of overlap.
These and other mixed cropping experiments have demonstrated that the subsistence farmer has developed a highly sophisticated system of cropping based upon good economic sense. We feel that the answer to the question is an unqualified "yes" and now intend moving to high input mixed cropping. Particularly we intend looking at the part played by nitrogen fixation by legumes within mixtures and the possibility of growing continuous legume crops within mixtures of various other crops. We also intend investigating rearrangements of the cereal component to give yet higher populations, possibly by closing up rows and sowing double rows to facilitate mechanization. We have already initiated lysimeter studies to investigate water use by high populations in mixtures.

Finally, preliminary studies have shown that trifluralin is selective in cotton, castor, okra, groundnuts, soybean, sunflower, and tomatoes; chlorbromuron is selective in soybean, maize, and sorghum; and linuron is selective in millet, maize, cowpea, cotton, soybean, and groundnuts. The last is being developed as a herbicide for use in millet/sorghum and cowpea mixtures.

Crop Production Practices in Intercropping Systems

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At the beginning of an intercrop research production program, it is important to identify quickly those factors that in combination increase agricultural production in terms of both quantity and quality.

It is suggested that an interlinked three-tier system be established involving: (1) studies on research fields; (2) experiments in village research-extension demonstrations; and (3) production data collection by sampling in actual farm conditions.

The purpose is to establish a testing and information network that will be self-checking. Priorities are established in meaningful terms within the real crop production sector. Data on the research innovations under development in the farmers' environment are continually being generated, analyzed, and corrected. These are all linked through field research studies, village research-extension experiments, and farmers' recommendations from within their own farming systems. The entire program is based on a recommendation-generating crop production system set within the framework in which the innovation is to function.

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